Armstrong Software Program

Humidifier Sizing and Selection

User's Manual Humidifier Sizing and Selection

For selected IBM and IBM Compatible Computers
Version 2.10, 2.20, 2.30, 2.40, 2.50

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PREFACE

This User's Manual explains how to use the Armstrong Software Program 2, Humidifier Sizing and Selection.

BEFORE YOU BEGIN

Armstrong Software Program 2 is designed to be used in conjunction with Armstrong Educational Handbook HB-501 and Bulletin No. 504. If you do not have these catalogs, contact Armstrong for copies.

Before starting this program, refer to page 2, "Computer Equipment" to determine if your computer and our software are compatible. If you are not familiar with the general operation of your computer system, contact the appropriate department in your company before beginning to use this program.

STEP-BY-STEP INSTRUCTIONS

This User's Manual provides detailed, step-by-step instructions for using all features of Armstrong Software Program 2.

The best way to learn how to use Program 2 is to familiarize yourself with this manual and Handbook HB-501 and Bulletin No. 504. Next, using your computer, work through the examples included in the "Operating Instructions" beginning on page 4.

Once you become familiar with the User's Manual you may use the Table of Contents for quick reference to the particular section of interest.

IMPORTANT

ARMSTRONG SOFTWARE PROGRAM 2 SHOULD BE UTILIZED AS A GUIDE FOR THE SIZING AND SELECTION OF HUMIDIFICATION EQUIPMENT BY EXPERIENCED PERSONNEL. SIZING, SELECTION AND INSTALLATION SHOULD ALWAYS BE ACCOMPANIED BY COMPETENT TECHNICAL ASSISTANCE OR ADVICE. WE ENCOURAGE YOU TO CONTACT ARMSTRONG OR ITS LOCAL REPRESENTATIVES FOR COMPLETE DETAILS.

INTRODUCTION

A BRIEF HISTORY

Dry air can cause a variety of costly, troublesome, and sometimes dangerous problems. In today's competitive environment, you can't afford not to humidify. In more than 45 years of designing, manufacturing, and applying humidification equipment, Armstrong has solved virtually every imaginable problem in steam humidification. In an effort to share this knowledge, we at Armstrong have developed Software Program 2. It deals with the sizing and selecting of steam humidifiers for a wide variety of applications.

ARMSTRONG SOFTWARE PROGRAM 2

Humidity-sensitive materials. Personnel. Delicate machinery and equipment. Proper levels of humidification can help you protect all of these assets and, in many cases, increase their production efficiency.

Proper humidification begins with the right humidification equipment, precisely sized to meet the requirements of each specific application. That means you spend valuable time performing complex and necessary calculations to determine humidification loads and humidifier requirements. Now, you can put an end to these manual calculations with Armstrong Software Program 2, our new computerized method of sizing and selecting steam humidifiers.

HERE'S WHAT IT CAN DO:

Program 2 is menu driven, user friendly software. You merely answer a few easy-to-understand questions concerning your specific humidifier application and Program 2 will:

- Calculate humidification loads
- Recommend specific steam humidifier models
- Print the complete steam humidifier specification

In addition, Program 2 will calculate:

- Psychrometric properties of air
- Equivalent room humidity from known duct conditions
- Required duct humidity from known room conditions

And, all in a matter of minutes.

COMPUTER EQUIPMENT

Armstrong Software Program 2 will work on most IBM and IBM compatible personal computer systems. Program 2 has been tested with the following computer systems:

IBM PC with PC-DOS 2.1 or 3.1
IBM PC XT with PC-DOS 2.1 or 3.1
IBM PC AT with PC-DOS 3.1
IBM CONVERTIBLE with PC-DOS
COMPAQ Portable with MS-DOS 3.1
COMPAQ Portable II with MS-DOS 3.1
COMPAQ Deskpro with MS-DOS 3.1
TANDON PCX with MS-DOS 3.1
TANDON PCA with MS-DOS 3.1
ZENITH 150 with MS-DOS 2.1
ZENITH 160 with MS-DOS 2.1

When using Program 2, you must use the DOS provided with your computer.

The minimum hardware requirements for Program 2 are:

IBM PC or Compatible
One diskette drive
192K bytes of Random Access Memory (RAM)
PC-DOS/MS-DOS 2.1 or later version

START-UP METHODS

When using Program 2, you must use the DOS provided with your computer. There are, however, two methods for using your DOS diskette with the Armstrong program. One method requires you to use your DOS diskette with the Armstrong diskette each time you run the Armstrong program. The second method requires you to prepare a "working diskette" combining your DOS diskette AND the Armstrong program on a blank diskette. The "working diskette" will be self loading and will eliminate future use of your DOS diskette. Listed below are instructions for implementing both methods on double drive systems, single drive systems and fixed (hard) drive systems:

DOUBLE DRIVE SYSTEMS

METHOD 1:

You may use the enclosed Armstrong Software Program 2 diskette with your DOS diskette. To do this, simply insert your DOS diskette in Drive A and turn the computer on. Enter the date and time when requested and press "Enter (or return)" to continue. When the Prompt A> appears on the screen, remove your DOS diskette from Drive A and insert Armstrong's diskette in Drive A. *Type LOGOH (or type H) and press "Enter (or return)". This will bring Armstrong Software Program 2 into the system and you may proceed with the operating instructions found on 4 of this booklet.

***NOTE:** If your computer does not have graphics capabilities, the command LOGOH will not bring the Armstrong program into your system. You may use the Armstrong program, however, by typing H after the Prompt A> and pressing "Enter (or return)", instead of LOGOH.*

METHOD 2:

If **you have graphics capabilities** on your computer, you may use Method 2 when running the Armstrong program. Method 2 requires you to format a blank diskette and make a "working diskette" of the Armstrong program. This procedure will make the system self loading, thus eliminating the need to use your DOS diskette once you have made a "working diskette". If you **do not have graphics capabilities** on your computer, we suggest that you use Method 1 to run the program. The following instructions apply for making a "working diskette".

1. The first step is to format a double density, double sided blank diskette. To do this, insert your DOS diskette in Drive A and turn your computer on. When requested, enter the date and time and press "Enter (or return)". The DOS Prompt A> will appear on the screen when DOS is ready to accept commands. When the Prompt A> appears, type FORMAT B:/S and press "Enter (or return)". Your computer screen will instruct you to insert your double density, double sided blank diskette in Drive B and press "Enter (or return)". The blank diskette in Drive B is now being formatted and the DOS operating system is being copied to it, making it self loading.

***NOTE:** Once the DOS operating system is transferred to your blank diskette in Drive B, your computer screen may ask you to enter a volume label or press "Enter (or return)" To simplify this procedure, press "Enter (or return)". Your computer screen may also ask if you want to format another diskette Y or N? Press **N** for No.*

START-UP METHODS (continued)

2. You are now ready to make a "working diskette" of the Armstrong program. When the Prompt A> appears on the screen, remove the DOS diskette from Drive A and insert Armstrong's Software Program 2 diskette in Drive A. Type COPY *.* B: and press "Enter (or return)". The DOS operating system is now copying the program from Armstrong's diskette in Drive A to your formatted diskette in Drive B.

3. You now have a "working diskette" of Armstrong Software Program 2 which is self loading. When you want to use this program in the future, simply insert the "working diskette" in Drive A and turn your computer on. The Armstrong program will automatically be loaded into your computer and will appear on your screen.

SINGLE DRIVE SYSTEMS

METHOD 1:

You may use the enclosed Armstrong Software Program 2 diskette with your DOS diskette. To do this, simply insert your DOS diskette in Drive A and turn the computer on. Enter the date and time when requested and press "Enter (or return)" to continue. When the Prompt A> appears on the screen, remove your DOS diskette from Drive A and insert Armstrong's diskette in Drive A. *Type LOGOH (or type H) and press "Enter(or return)". This will bring Armstrong Software Program 2 into the system and you may proceed with the operating instructions found on page 4 of this booklet.

***NOTE:** If your computer does not have graphics capabilities, the command LOGOH will not bring the Armstrong program into your system. You may use the Armstrong program, however, by typing H after the Prompt A> and pressing "Enter (or return)", instead of LOGOH.*

METHOD 2:

If **you have graphics capabilities** on your computer, you may use Method 2 when running the Armstrong Program. Method 2 requires you to format a blank diskette and make a "working diskette" of the Armstrong program. This procedure will make the system self loading, thus eliminating the need to use your DOS diskette once you have a "working diskette". If you **do not have graphics capabilities** on your computer, we suggest that you use Method 1. The following instructions apply for single drive systems:

1. Insert your DOS diskette in Drive A and turn your computer on. When requested, enter the date and time and press "Enter (or return)". The DOS Prompt A> will appear on the screen when DOS is ready to accept commands.

2. You are now ready to format a blank double density, double sided diskette. With the DOS diskette in Drive A, type FORMAT A:/S and press "Enter (or return)". The DOS operating system will instruct you to remove your DOS diskette from Drive A and insert the blank diskette to be formatted and press "Enter (or return)". The DOS system is now formatting your blank diskette in Drive A and copying the operating system to it, making it self loading.

***NOTE:** Once the DOS operating system is transferred to your blank diskette in Drive A, your computer screen may ask you to enter a volume label or press "Enter (or return)". To simplify this procedure, press "Enter (or return)". Your computer screen may also ask if you want to format another diskette Y or N? Press N for No.*

3. When the DOS Prompt A> appears on the screen, remove the formatted diskette from Drive A and insert the Armstrong Software Program 2 diskette. Type COPY *.* and press "Enter (or return)". The screen will then instruct you to remove the program diskette from Drive A and insert the formatted diskette. The DOS system is now copying the program modules from the Armstrong program diskette to your formatted diskette, making the "working diskette" self loading.

4. You now have a "working diskette" of Armstrong Software Program 2 which is self loading. When you want to use this program in the future, simply insert the "working diskette" in Drive A and turn your computer on. The Armstrong program will automatically be loaded into your computer and will appear on your screen.

FIXED (HARD) DISK SYSTEM

If you have a fixed (hard) disk drive system, we suggest that you make a "subdirectory" which will contain Armstrong Software Program 2. The instructions for doing this are as follows:

START-UP METHODS (continued)

1. Insert your DOS diskette in Drive A and turn your computer on. At the Prompt A> type C: and press "Enter (or return)" to get to the root directory of your fixed disk. If DOS is installed on your fixed disk simply load by turning on the computer. After entering DATE and TIME you will be at the Prompt C> in the root directory.

2. Create a subdirectory on your fixed disk and name it HUMD, using the DOS md command. With the fixed disk in its root directory, type MD\HUMD and press "Enter (or return)". The DOS command MD\HUMD is now creating a subdirectory named HUMD.

3. When the DOS Prompt C> appears on the screen, move to the subdirectory HUMD using the DOS cd command. Type CD\HUMD and press "Enter (or return)". The DOS command CD\HUMD will move you to the subdirectory HUMD.
4. When the DOS Prompt C> appears on the screen, insert the program diskette in Drive A. Type COPY A:*.EXE and press "Enter (or return)". The DOS command COPY A:*.EXE is copying the program modules from the program diskette (source) in Drive A to the subdirectory HUMD on your fixed diskette.

5. You have completed the procedure and have installed Armstrong Software Program 2 on your fixed disk. To run the program, *type LOGOH (or type H) and press "Enter (or return)".

***NOTE:** If your computer does not have graphics capabilities, the command LOGOH will not bring the Armstrong program into your system. You may use the Armstrong program, however, by typing H after the Prompt C> instead of LOGOH.*

ARMSTRONG SOFTWARE PROGRAM 2 - HUMIDIFIER SIZING & SELECTION OPERATING INSTRUCTIONS

Program 2 is menu driven and user friendly - minimizing the time required to learn how to use. The best way to learn Program 2 is by completing the examples given in this section. While only two sample applications are explained, the screens and instructions for each application follow the same basic format.

IMPORTANT USER INSTRUCTIONS ARE INCLUDED IN THE EXAMPLES. IT IS VITAL THAT YOU READ THIS SECTION OF THE USER'S MANUAL IN ITS ENTIRETY AND EXECUTE THE EXAMPLES ON YOUR COMPUTER.

1. Refer to the Start-Up Methods described on page 2. Load the program into your computer using either Method 1 or 2.
2. Read the introductory Screen "A" and press the "Enter (or return)" key to continue.

Armstrong Steam Humidifier Sizing

ARMSTRONG SOFTWARE PROGRAM 2
Steam Humidifier Sizing & Selection

This program is a supplement to Armstrong's Humidification Handbook HB-501 and Series 9000 Humidifier Bulletin 504.

If you do not have Handbook HB-501 ask your Armstrong Representative or Armstrong for a copy.

(ARMSTRONG'S Telephone No. (616) 273-1415)

This program should be utilized as a guide for the selection of steam humidification equipment by experienced personnel. Selection or installation should always be accompanied by competent technical assistance or advice. We encourage you to contact Armstrong or its local representative for complete details.

PLEASE PRESS RETURN TO CONTINUE

SCREEN "A"

OPERATING INSTRUCTIONS (continued)

3. Review the “Application Menu” in Screen “B”. **NOTE:** If you are not familiar with computer operation, we suggest you select No. 9 and review the notes on inputting data. This information is also printed on page 22 of this book for easy reference. Throughout the program, you will see instructions at the bottom of the screen advising the appropriate “F” key to press for different computer functions.

   If you are familiar with computer operation, enter the item number which applies to your installation and press the “Enter (or return)” key. As an example, please enter No. 1 — Duct (100% Outside Air).

```
Application Menu                          Armstrong Steam Humidifier Sizing

                    TYPES OF HUMIDIFYING APPLICATIONS

                    1)   Duct (100% Outside air)
                    2)   Duct (% Outiside air)
                    3)   Duct (Economizer Cycle)
                    4)   Area
                    5)   Psychrometric Chart
                    6)   Room to Duct Comparison
                    7)   Duct to Room Comparison
                    8)   Select a Humidifier
                    9)   Instructions
                    0)   Exit Program

                              Select an Application -
```

SCREEN “B”

4. Review the “Application Notes” in Screen “C”. Refer to Pages 29-34 in Handbook HB-501 for additional information on system layouts for steam type humidifiers. If you want to continue, press the “Enter (or return)” key. If you want to review a different application, press the “F9” key to return to the Application Menu. If you want to stop working with the program, press the “F10” key. For this application, press the “Enter (or return)” key to continue working with the program.

```
Duct (100% Outside Air)                   Armstrong Steam Humidifier Sizing

Application Notes:

A duct humidifier is installed in an air handling system duct. For best operation,
the humidifier should be installed in the warmest, slowest duct air with a wide duct
section for good mixing.

The volume, temperature and relative humidity of duct air must be sufficient to
absorb the amount of moisture discharged by the humidifier as required by the
room and control system.
Note: To compare required duct or room conditions to see if moisture levels are
attainable, use the following sections of this program:

        6. Room to Duct Comparison
        7. Duct to Room Comparison

Armstrong has data sheets available showing typical system layouts for steam-
type humidifiers. See Handbook HB-501 pp. 29-34.

              F9 - Menu          F10 - Exit          ↵ - Enter
```

SCREEN "C"

OPERATING INSTRUCTIONS (continued)

5. Screen "D" shown below is a "building screen". In other words, after you enter the information requested on each line and press the "Enter (or return)" key, the next line will appear on the screen. Each input has a default value. For this example, we have used only one of the defaults. Therefore, enter the information shown in Screen "D" below.

   After you have entered the necessary data, the program will calculate the required humidifier capacity. Please review your inputs to be sure they are correct.

NOTE: *If you would like to see if the moisture levels are attainable, press "F9" and return to the Application Menu. Next, you should enter 6. The inputs you inserted will be transferred to this part of the program. A default value of 60°F. is used*
for the duct temperature. If you know your actual duct temperature when working with this portion of the program, you should enter it when requested. After reviewing the calculated values, press the "F9" key and return to the Application Menu. You may then press No. 1 and continue with the problem.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Sizing

INPUTS

Volume of Outside Air              =     4000  cfm
Outside Air Temperature            =     0     deg F
Outside Air Relative Humidity      =     55    %RH
Altitude                           =     100   feet above sea level
Desired Room Temperature           =     72    deg F
Desired Room Relative Humidity     =     45    %RH

CALCULATED VALUES

Required Humidifier Capacity       =     127.5 lbs/hr

Use section 6, to check if these moisture levels are attainable.

     Fl - Restart Appl.        F2 - Prt Data
     F9- Menu                  F10 - Exit        ↵ - Enter Select Humidifier
```

SCREEN "D"

OPERATING INSTRUCTIONS (continued)

6. Review Screen “E”. If steam supply is available, simply press the “Enter (or return)” key which is the default for “Yes”. You should then enter the steam supply pressure. **NOTE:** If a steam supply is not available, press the “N” key for “No” and then press the “Enter (or return)” key. You will see a message advising you to contact your Armstrong Representative or the factory to select an electronic steam humidifier. If you have no steam supply, you should press the “F9” key to return to the Application Menu. For this example, press the “Enter (or return)” key and enter a steam supply pressure of 45 and press “Enter (or return)” again.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

          You have sized a load for a Duct (100% Outside Air)

          Required Humidifier Capacity     127.5 lbs/hr

          Is a steam supply available?      (Y or N) Y

          Steam supply pressure            =      45 psig

          Fl - Restart Appl.
          F9 - Menu          F10 - Exit        ↵ - Enter
```

SCREEN “E”

7. Screen “F” shows the recommended humidifier for your application. The function keys at the bottom of the screen allow you to proceed in a number of ways. Please press the “Enter (or return)” key to continue.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

     The Recommended Humidifier for your Application is:

          Model Number:                    91m
          Orifice Size:                    1/4
          Operating Steam Pressure:        45     psig
          Humidifier Capacity:        135.8  lbs/hr

     Fl - Restart Appl.          F2 - Prt Data        F3- Backup
     F9 - Menu                   F10 - Exit- -        ↵- Enter (Select Actuator)
```

SCREEN “F”

OPERATING INSTRUCTIONS (continued)

8. Screen "G" lists the types of operators available. For this example, enter No. 2 and press the "Enter (or return)" key.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

                    TYPES OF OPERATORS AVAILABLE

                          1)    Pneumatic
                          2)    Electric Modulating
                          3)    Electric On/Off
                          4)    Optional Pneumatic
                          5)    Optional Electric Modulating

                               Enter your operator choice      2


Fl - Restart Appl.                F3- Backup
                  F9 - Menu       F10 - Exit        ↵ - Enter
```

SCREEN "G"

9. Screen "H" allows you to select the operator you prefer from the electronic modulating operators in stock. For this example, enter No. 4 and press "Enter (or return)".

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

                  ELECTRIC MODULATING OPERATORS IN STOCK

  1)  Barber - Colman   MP-361    Motor              24v  AC
  2)  Barber - Colman   MP-461    Motor              120v AC
  3)  Barber - Colman   MP-5210   Hydraulic         120v AC
  4)  Honeywell         M945A     Motor w/Bal. Relay  24v  AC
  5)  Honeywell         M945B     Motor              24v  AC
  6)  Honeywell         M745S     Electronic         120v AC

        Honeywell M945A & B can be furnished with a transformer
    for use with 120, 208 or 240 v AC service.

                        Enter your operator choice      4

    Fl - Restart Appl.              F3- Backup
                      F9 - Menu     F10 - Exit        ↵ - Enter
```

SCREEN "H"

OPERATING INSTRUCTIONS (continued)

10. Screen "I" allows you to select the transformer input voltages for your application. For this example, enter No. 3 and press the "Enter (or return)" key.

```
Duct (100% Outside Air)              Armstrong Steam Humidifier Selection

                    TRANSFORMER INPUT VOLTAGES

                        1)   24v AC      50/60hz*
                        2)  120v AC      50/60hz
                        3)  208v AC      50/60hz
                        4)  240v AC      50/60hz

                       * transformer not used for 24v AC service

                    Enter your input voltage      3

     Fl - Restart Appl.              F3- Backup
                        F9 - Menu    F10 - Exit        ↵ - Enter
```

SCREEN "I"

11. Screen "J" contains information regarding multiple manifold installations. For this example, press the "Enter (or return)" key which is the default for "No". ***NOTE:*** If select "Y" for "Yes", you will be advised to contact your Armstrong Representative or the Factory for assistance.

```
Duct (100% Outside Air)              Armstrong Steam Humidifier Selection

  Armstrong duct humidifiers for air handling systems may be installed in fan
housings, plenums, or ducts.

  Multiple manifolds should be considered whenever any of the following conditions
exist at the humidifier location:

        a. Duct air temperature is below 65 deg. F.
        b. Duct air velocity exceeds 800 fpm.
        c. Final or high efficiency filters downstream from humidifier.
        d. Height of duct section exceeds 36 inches.
        e. Visible vapor impinges upon coils, fans, dampers, filter (not final),
           turning vanes, etc. located downstream from humidifier.

            Are multiple manifolds needed (Y or N)      N

     Fl - Restart Appl.              F3- Backup
                        F9 - Menu    F10 - Exit        ↵ - Enter
```

SCREEN "J"

OPERATING INSTRUCTIONS (continued)

12. Screen "K" contains information for installing manifolds correctly. For this example, enter 15 for the duct width and press the "Enter (or return)" key to continue.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

                          MANIFOLD SELECTION

  Normal manifold installation is with the manifold extending horizontally. When
required the manifold may extend vertically upward. It must not extend vertically
downward.
      Horizontal manifolds should be perfectly level with the discharge holes
pointed upstream against the air flow. Manifolds over 1 foot in length should be
supported.

  Always size the manifold to span the widest dimension of the duct section
(horizontal or vertical). Utilize an expanded section, when the narrowest dimension
is less than 8 inches.

  See Bulletin no. 544, Installation, Operation and Servicing Armstrong Manifold
Type Humidifiers for Air Handling Systems for additional installation Do's and
Don'ts.

                          Enter Duct Width (in.)          15

      Fl - Restart Appl.                F3- Backup
                          F9 - Menu     F10 - Exit-       ↵ - Enter
```

SCREEN "K"

13. Screen "L-l" is a building screen. You may or may not wish to print this information on your humidifier specification. If you do, simply answer each question after the date is entered and press the "Enter (or return)"key. After you enter your comments, you may continue by selecting one of the commands at the bottom of your screen.

If your computer is not connected to a printer, you may review your humidification specification on the screen by pressing the "F4" key.

If your computer is connected to a printer, you may press the "F2" key to receive a printout. After pressing the "F2" key, you may then decide if you want to print the complete specification or an abbreviated form. Screen "L-2" shows a complete specification printout, while Screen "L-3" shows an abbreviated form.

```
Duct (100% Outside Air)                    Armstrong Steam Humidifier Selection

Today's Date:
     09-29-1988
Your Company's Name:
     ABC Company
Your Name:
     bh
Revision Level:
     10:17
Humidifier ID #:
     MS/2
Comments:
     none

     Fl - Restart Appl.   F2 - Prt Spec      F3- Backup   F4 - Prt to Scrn
     F8 - Prt to File     F9 - Menu          F10 - Exit     ↵ - Enter
```

SCREEN "L-1"

OPERATING INSTRUCTIONS (continued)

ARMSTRONG STEAM HUMIDIFIER SPECIFICATION DATE :09-29-1988
Application :Duct (100% Outside Air) Rev. No. :10:17

Company Name :ABC Company By :bh
Humidifier ID No. :MS/2
Comments :

SPECIFIC CONDITIONS

Room Design Conditions		72 deg F/ 45 % rh
Outdoor Conditions		0 deg F/ 55 % rh
Volume of Outside Air Humidified		4000 cfm
Humidifier Capacity		135.8 lbs/hr at 45 psig
Model No.		HEM-91 M-1.5 with a 1/4 orifice
Mode of Control		Electric Modulating
Operator Model		Honeywell M945A 24v AC
Transformer Characteristics		208v 50/60hz
Valve Rangeability	31:1	
Minimum Controlled Flow		4.3 lbs/hr
Manifold Length		18 inches
Humidifier Assembly:	Length x Height	27 x 19.5 inches
	Weight	44 lbs.
Connection Sizes:	Steam Inlet	1/2 NPT
	Drain	1 NPT
Body Mounting Holes		2 7/16 thru holes

GENERAL SPECIFICATIONS

The humidifier shall be of the cast iron steam separator type providing full separation ahead of an integral steam jacketed control valve which discharges through an internal steam jacketed drying chamber, a silencing chamber and a steam jacketed distribution manifold.

A The humidifier shall receive steam at supply pressure and discharge at atmospheric pressure. It shall be furnished with an inlet strainer and an external inverted bucket steam trap.

B. The cast iron separator shall consist of a drying chamber surrounded by a separating chamber. The separating chamber shall be of a volume and design that will disengage and remove all water droplets and all particulate matter larger than 3 microns when the humidifier is operating at maximum capacity. The drying chamber shall be jacketed by steam at supply pressure and filled with a stainless steel silencing medium which absorbs most of the noise of the escaping steam.

C. The stainless steel metering valve shall be integral within the separator and shall be jacketed by steam at supply pressure and temperature to prevent condensation. The valve shall be a parabolic plug with a 3/4 inch stroke, providing the high rangeabilities required to achieve full and accurate modulation of steam flow over the entire stroke of the valve.

D. The distribution manifold shall be all stainless steel, provide uniform distribution over its entire length and be jacketed by steam at supply pressure to assure that vapor discharged is free of water droplets. A full length stainless steel internal silencing screen shall be provided.

E. Humidifier shall be equipped with an interlocked temperature switch to prevent the humidifier from operating before start-up condensate is drained.

OPERATING INSTRUCTIONS (continued)

ARMSTRONG STEAM HUMIDIFIER SPECIFICATIONDATE :09-29-1988
Application :Duct (100% Outside Air) Rev. No :10:17

Company Name :ABC Company By :bh
Humidifier ID No. :MS/2
Comments :

SPECIFIC CONDITIONS

Room Design Conditions		72 deg F/ 45 % rh
Outdoor Conditions		0 deg F/ 55 % rh
Volume of Outside Air Humidified		4000 cfm
Humidifier Capacity		135.8 lbs/hr at 45 psig
Model No.		HEM-91 M-1.5 with a 1/4 orifice
Mode of Control		Electric Modulating
Operator Model		Honeywell M945A 24v AC
Transformer Characteristics		208v 50/60hz
Valve Rangeability	31:1	
Minimum Controlled Flow		4.3 lbs/hp
Manifold Length		18 inches
Humidifier Assembly:	Length x Height	27 x 19.5 inches
	Weight 44 lbs.	
Connection Sizes:	Steam Inlet	1/2 NPT
	Drain	1 NPT
Body Mounting Holes		2 7/16 thru holes

SCREEN "L - 3"

14. You have completed our first instructional example. Please continue on to the next application example covering area humidification by pressing the "F9" key to return to the Application Menu.

15. Remember to refer to Handbook HB-501 and Bulletin No. 504. If you have questions, please call your Armstrong Representative, or the factory for assistance.

ARMSTRONG SOFTWARE PROGRAM 2 - STEAM HUMIDIFIER SIZING & SELECTION

OPERATING INSTRUCTIONS FOR NO. 4 - AREA HUMIDIFICATION

After you complete the sample problem beginning on page 4, you will want to take a few minutes and review Application No. 4 covering area humidification.

1. Refer to the Start-up Methods described on page 2. Load the program into your computer using Method 1 or 2.

2. Read the introductory screen and press the “Enter (or return)” key to continue.

3. Review the Application Menu on the screen. Enter No. 4 — Area.

4. Review the application notes in Screen “C”. If you want to continue, press the “Enter (or return)” key. If you want to review a different application, press the “F9” key. If you want to quit working with the program, press the “F10” key to exit the program. For this example, press the “Enter (or return)” key to continue.

Area Armstrong Steam Humidifier Sizing

Application Notes:

An area humidifier is installed directly in the area to be humidified. Good air movement must be allowed around the humidifier to insure sufficient mixing of humidified air.

The humidistat location should be 20 to 30 feet from the humidifier and should have a clear line of site to the humidifier. Good air sampling by the humidistat is essential for accurate humidity control.

F9 - Menu F10 - Exit- ↵ - Enter

SCREEN “C”

OPERATING INSTRUCTIONS (continued)

5. Review Screen "D-1"**. If you know the volume of your room in cubic feet,** enter the information on the line "Space Volume" and press the "Enter (or return)" key to continue to screen "E". **If you do not know the volume of your room,** press the "Enter (or return)" key. Then input the length, width, and ceiling height as requested on screen "D-2".

   Screen "D-2" then shows the air changes per hour for average room conditions. For this example, enter 1.5 air changes per hour and press the "Enter (or return)" key. **PLEASE NOTE: If the conditions shown on Screen "D-2" do not apply to your application, you should input the actual number of air changes per hour for your installation.** The next item requests additional ventilation fan capacity. For this example, enter 8000 and press the "Enter (or return)" key to continue.

```
Area                                        Armstrong Steam Humidifier Sizing

Enter the space volume in cubic feet or enter 0 to enter room dimensions (LxWxH)
in feet.

     Space Volume              =      0      ft3

                  Fl - Restart Appl.
                  F9 - Menu          F10 - Exit-        ↵ - Enter
```

SCREEN "D - 1"

```
 Area                                        Armstrong Steam Humidifier Sizing

 Enter the space volume in cubic feet or enter 0 to enter room dimensions (LxWxH) in
feet.

      Length                          =      150    ft
      Width                           =      100    ft
      Ceiling Height             =      10     ft

 Air Changes Per Hour (natural ventilation):

 Rooms, 1 or 2 sides exposed                    1 - 1.5
 Rooms, 3 or 4 sides exposed                    2
 Rooms, no windows or outside doors             .5 - .75

 These air changes are taking place under average conditions exclusive of air provided
for ventilation or regain of hygroscopic materials.

 Air changes/Hr                          =      1.5

 Additional Ventilation Fan Capacity     =      8000  cfm

             Fl - Restart Appl.
             F9 - Menu          F10 - Exit         ↵ - Enter
```

SCREEN "D - 2"

OPERATING INSTRUCTIONS (continued)

6. The Application Notes in Screen “E” list some general guidelines for choosing the number of humidifiers required for your installation. Additional information can be found on pages 36 - 38 in Handbook HB-501. Note that the room volume of 150,000 ft. 3 is now on the screen. This figure is the result of the inputs you inserted in Screen “D-2” (150 ft. length x 100 ft. width x 10 ft. height = 150,000 ft. 3).

   As an example, let’s assume that we are humidifying an electronic parts manufacturing area. Static electricity control is important. To get the correct number of humidifiers, you should divide the room volume of 150,000 ft.3 by the recommended spacing volume for static electricity control which is 30,000 ft. 3. The recommended number of humidifiers is 5. (150,000 ft. 3 divided by 30,000 ft. 3 = 5 humidifiers). Therefore, input 5 humidifiers and press the “Enter (or return)” key to continue.

Area — Armstrong Steam Humidifier Sizing

Application Notes:

Below are some general guidelines for choosing the number of humidifiers needed based on space volume. To insure good distribution of humidified air throughout the area, it is necessary to consider space volume, physical layout and humidification loads. See Handbook HB-501 pp. 36 - 38 for helpful information on area units.

AREA TYPE	SPACING VOLUME (ft3)
Comfort Control	80000
Hygroscopic material storage	50000
Static electricity control	30000
Computer room	20000

Your room volume is 150000 ft. 3

Number of humidifiers required = **5**

F1 - Restart Appl.
F9 - Menu F10 - Exit- ↵ - Enter

SCREEN “E”

OPERATING INSTRUCTIONS (continued)

7. Screen "F" shows the inputs you have made so far. It is also a building screen beginning with "outside air temperature". Each new condition has a default on the screen. For this example, we have used some of the defaults. When a default is used, simply press the "Enter (or return)" key to continue to the next entry. If the default is not used, input the information shown on the screen below and then press the "Enter (or return)" key to continue to the next condition. After you have entered all the information, the calculated values will appear on the screen with your inputs. Please review your inputs to be sure they are correct. If they are and you want to continue, simply press the "Enter (or return)" key. Other command functions are shown on the bottom of your screen.

```
Area                                    Armstrong Steam Humidifier Sizing

          INPUTS
Length                                  =     150    ft
Width                                   =     100    ft
Ceiling Height                          =     10     ft
Air Changes/Hour (natural ventilation)  =     1.5
Ventilation Fan Capacity                =     8000   cfm
Number of Humidifiers Required      =   5
Outside Air Temperature                 =     -10    deg F
Outside Air Relative Humidity           =     25     %RH
Altitude                                =     1000   feet above sea level
Desired Room Temperature                =     70     deg F
Desired Room Relative Humidity          =     45     %RH

CALCULATED VALUES

Required Humidifier Capacity            =     75.4   lbs/hr
Total Humidification Load               =     377    lbs/hr

     Fl - Restart Appl.      F2 - Prt Data      F3- Backup
     F9 - Menu               F10 - Exit         ↵ - Enter (Select Humidifier)
```

SCREEN "F"

8. Screen "G" requests information regarding the steam supply. If you have a steam supply, press the "Enter (or return)" key which is the default for "Yes". Next, enter the steam supply pressure which is 35 psig for this example, and press the "Enter (or return)" key. If an on/off humidifier is satisfactory, press the "Enter (or return)" key which is the default for "Yes". This screen also asks if a fan is required. For this example, a fan is not necessary, so press the "Enter (or return)" key which is also the default for "No".

NOTE: *If a steam supply is not available, press the "N" key for "No" and the "Enter (or return)" key. You will see a message advising you to contact your Armstrong Representative or the factory to select an electronic steam humidifier.*

```
Area                                    Armstrong Steam Humidifier Selection

You have sized a load for an Area

Required Humidifier Capacity 75.4 lbs/hr

Is a steam supply available? (Y or N) Y

Steam supply pressure                       =     35     psig

Is an on-off humidifier satisfactory? (Yes/No) [Y]?

Is a fan required? (Y or N) N

          Fl - Restart Appl.
          F9 - Menu          F10 - Exit-        ↵ - Enter
```

SCREEN "G"

OPERATING INSTRUCTIONS (continued)

9. Screen “H” shows the recommended humidifier for your application. Please press the “Enter (or return)” key to continue.

```
Area                                  Armstrong Steam Humidifier Selection

The Recommended Humidifier for your Application is:

     Model Number:                    VSA-92
     Orifice Size:                    7/32
     Operating Steam Pressure:        35    psig
     Humidifier Capacity:       89.6  lbs/hr

     Fl - Restart Appl.         F2 - Prt Data      F3 - Backup
                                F9 - Menu          F10 - Exit-   ↵ - Enter
```

SCREEN “H”

10. Screen “I-1” below is a building screen. You may or may not wish to print this information on your humidifier specification. If you do, simply answer each question after the date is entered and press the “Enter (or return)” key. After you enter your comments, you may continue by selecting one of the commands at the bottom of your screen.

    If your computer is not connected to a printer, you may review your humidification specification on the screen by pressing the “F4” key.

    If your computer is connected to a printer, you may press the “F2” key to receive a printout. After pressing the “F2” key, you may then decide if you want to print the complete specification or an abbreviated form. Screen “I-2” shows a complete specification printout, while Screen “I-3” shows an abbreviated form.

```
Area                                  Armstrong Steam Humidifier Selection

Today's Date:
     09-29-1988
Your Company's Name:
     ABC Company
Your Name:
     bh
Revision Level:
     10:05
Humidifier ID #:
     MS/ 1
Comments:
     none

Fl - Restart Appl.     F2 - Prt Spec     F3 - Backup  F4 - Prt to Scrn
F8 - Prt to File       F9 - Menu         F10 - Exit-   ↵ - Enter
```

SCREEN “I-1”

OPERATING INSTRUCTIONS (continued)

ARMSTRONG STEAM HUMIDIFIER SPECIFICATION DATE :09-29-1988
Application :Area Rev. No. :10:05

Company Name :ABC Company By :bh
Humidifier ID No. :MS/1
Comments :none

SPECIFIC CONDITIONS

Room Design Conditions		70 deg F/ 45 % rh
Room Dimensions: Width	100 ft	
Length		150 ft
Ceiling Height	10 ft	
Air changes per hour		1.5
Ventilation Fan Capacity		8000 cfm
Outdoor Conditions		-10 deg F/ 25 % rh
Humidifier Capacity		89.6 lbs/hr at 35 psig
Model No.		VSA-92 with a 7/32 orifice.
Mode of Control		Electric On/Off
Operator Model		Solenoid
Coil Electrical Characteristics		120v, 50/60 hz, 10.5 watts, class H
Other voltages available. Consult your Armstrong Rep. or the Factory.		
Humidifier Assembly:	Length x Height	7.6 x 10.8 inches
	Weight 33 lbs	
Connection Sizes:	Steam Inlet	3/4 NPT
	Drain	1 NPT
Body Mounting Holes		2 7/16 thru holes

GENERAL SPECIFICATIONS

The humidifier shall be of the cast iron steam separator type with full separation ahead of the control valve and with internal drying chamber and steam jacketed outlet to assure discharge of dry steam only.

A. The humidifier shall receive steam at supply pressure.

B. Separating chamber shall be drained by an inverted bucket steam trap.

C. An integral stainless steel valve shall control flow of steam at supply pressure to the drying chamber. The drying chamber shall be filled with stainless steel silencing material. Vapor shall be discharged from the drying chamber through the steam jacketed outlet at atmospheric pressure to provide relative humidity at the specified level.

D. A temperature switch shall be employed to prevent humidifier from operating before cold start-up condensate is drained.

SCREEN "I-2"

OPERATING INSTRUCTIONS (continued)

ARMSTRONG STEAM HUMIDIFIER SPECIFICATIONDATE ;09-29-1988
Application :Area Rev. No. :10:05

Company Name :ABC Company By :bh
Humidifier ID No. :MS/1
Comments :none

SPECIFIC CONDITIONS

Room Design Conditions		70 deg F/ 45 % rh.
Room Dimensions:	Width	100 ft
	Length	150 ft
	Ceiling Height	10 ft
Air changes per hour		1.5
Ventilation Fan Capacity		8000 cfm
Outdoor Conditions		-10 deg F/ 25 % rh
Humidifier Capacity		89.6 lbs/hr at 35 psig
Model No.		VSA-92 with a 7/32 orifice.
Mode of Control		Electric On/Off
Operator Model		Solenoid
Coil Electrical Characteristics		120v, 50/60 hz, 10.5 watts, class H
Other voltages available. Consult your Armstrong Rep. or the Factory.		
Humidifier Assembly:	Length x Height	7.6 x 10.8 inches
	Weight	33 lbs
Connection Sizes:	Steam Inlet	3/4 NPT
	Drain	1 NPT
Body Mounting Holes		2 7/16 thru holes

SCREEN “I - 3”

11. You have completed our instructional examples for sizing duct and area humidifiers. We suggest that you now try sizing and selecting duct and area humidifiers, entering your application information.

12. Remember to refer to Handbook HB-501 and Bulletin No. 504. If you have any questions, please call Armstrong International, Inc., or your local Armstrong Representative.

ARMSTRONG SOFTWARE PROGRAM 2 - HUMIDIFIER SIZING AND SELECTION

OPERATING INSTRUCTIONS FOR "NO. 8 - SELECT A HUMIDIFIER"

Application No. 8 — "Select a Humidifier" is a humidifier selection program which should only be used by experienced personnel who know the sizing parameters of the application. It is not a humidifier sizing program. In this portion of the program, you are sizing and selecting humidifiers for your application, NOT ARMSTRONG. We suggest that you contact your Armstrong Representative or the Armstrong Application Engineering Department (616) 273-1415, if you need assistance for sizing and selecting humidifiers not found on the Application Menu of this program.

After you complete the sample problems beginning on page 4, you may wish to become familiar with "No. 8 - Select a Humidifier". We recommend, however, that you use this **only** if other selections on the Application Menu do not meet your specific requirements.

1. Refer to the Start-up Methods described on page 2. Load the program into your computer using Method 1 or 2.

2. Read the introductory Screen "A" and press the "Enter (or return)" key.

3. Review the Application Menu on Screen "B". Enter No. 8 - "Select a Humidifier".

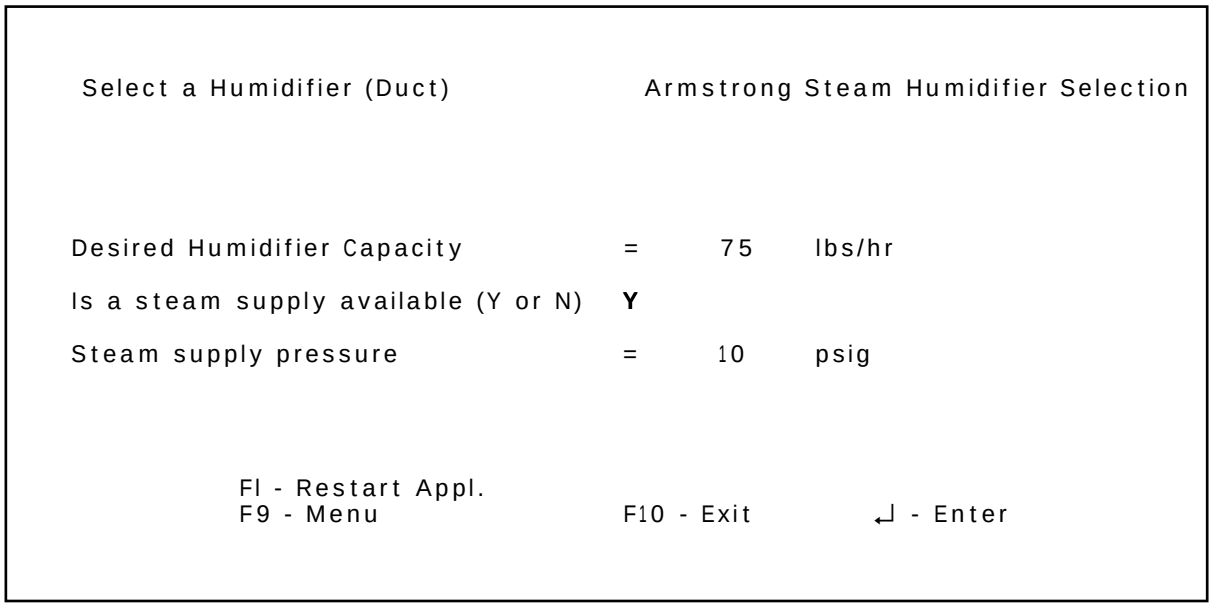
4. Review the application notes on Screen "C" below. Note that you **must know** the humidification load and the steam supply pressure of your installation to proceed with this application. Also, note that this part of the program is to be used for duct installations. If you have a direct area installation, you should return to the Application Menu and select No. 4 for area humidification. For this application, press "Enter (or return)" and continue.

```
Select a Humidifier (Duct)                Armstrong Steam Humidifier Sizing

Application Notes:

This section can be used when the humidification load has been previously
calculated by experienced personnel.

After entering the humidification load and steam pressure, the program will
select the required humidifier model for duct installation and allow a steam
humidifier specification to be printed.  For direct area installation, please use
section 4.

            Fl - Restart Appl.
            F9 - Menu          F10 - Exit          ↵ - Enter
```

SCREEN "C"

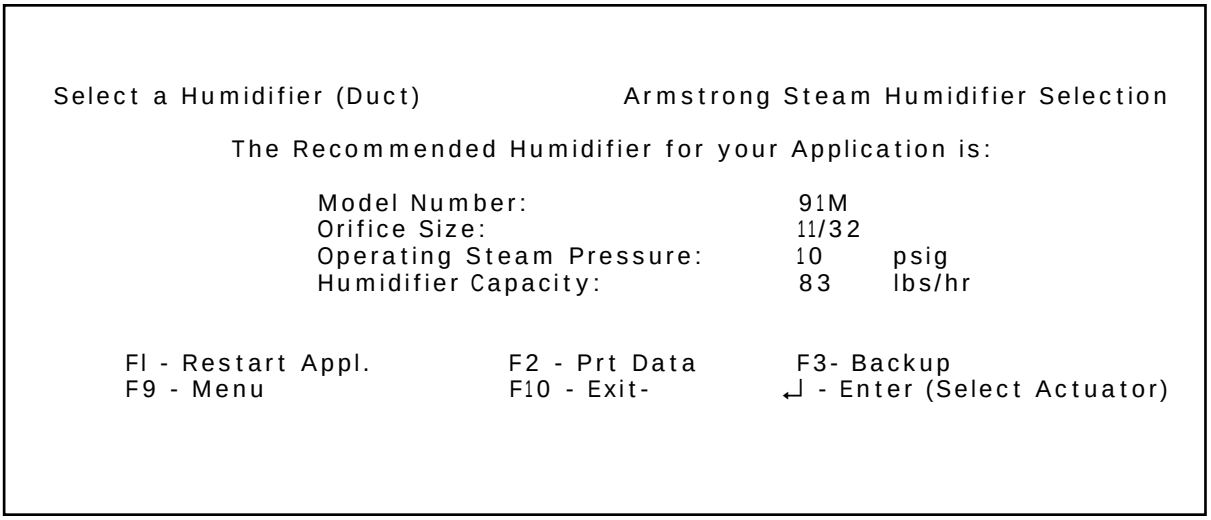
OPERATING INSTRUCTIONS — NO. 8 — "SELECT A HUMIDIFIER"

5. Review Screen “D”. This screen asks for the desired humidifier capacity and the steam supply pressure. For this example, enter the information shown on Screen “D” and press the “Enter (or return)” key to continue.


Select a Humidifier (Duct)
Armstrong Steam Humidifier Selection
Desired Humidifier Capacity = 75 lbs/hr
Is a steam supply available (Y or N) Y
Steam supply pressure = 10 psig
Fl - Restart Appl.
F9 - Menu
F10 - Exit
↵ - Enter

SCREEN “D”

6. Screen “E” shows the recommended humidifier for your application based on the information you entered.



SCREEN “E"

7. The remaining operating instructions for “No. 8 — Select a Humidifier” are similar to those used for other applications.

INSTRUCTIONS FOR INPUTTING DATA

The following keys can be used to help input and edit data.

↵ (Enter) — The data displayed in the input field will be saved and cursor will move to the next input field

Spacebar — Character will be erased and cursor will move right one column

BkSp (backspace) — Cursor will move left one column and erase character

Esc (escape) — Input field will be erased

← (cursor left) — Cursor will move left one column

→ (cursor right) — Cursor will move right one column

The following function keys are used in this program. They are active only when displayed at bottom of screen.

F1 - Restart Appl:	returns to first data input screen
F2 - Prt Data:	prints screen data on line printer (LPT1)
F2 - Prt Spec:	prints specification on line printer (LPT1)
F3 - Backup:	backs up program one or more screens
F4 - Prt to Scrn:	prints specification on screen
F5 - Select Booster:	will select booster model number if required for economizer cycle
F8 - Prt to File:	prints specification to file for later retrieval
F9 - Menu:	returns to application menu
F10 - Exit:	exits program

EDUCATIONAL VIDEO SERIES ON HUMIDIFICATION

To help you understand humidity and humidification, Armstrong offers a two-part video program, “It’s the Humidity”.

The first 25-minute program explains humidity and gives you reasons to consider humidification. It begins with a few basics — relative humidity, how temperature affects it and how humidity impacts on people and things in their surroundings. You’ll hear experts explain how improper humidification can damage your health, electronic equipment, buildings, machines and materials such as wood and paper.

The second 20-minute program covers the four ways to humidify — what they are and how they work. The tape focuses on steam humidification and why it offers low maintenance, cleanliness and efficiency, making it the best choice for most applications.

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Marketing Services Department
Armstrong International, Inc.
816 Maple Street
Three Rivers, MI 49093

Phone: (616) 273-1415

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Armstrong International, Inc.
816 Maple Street
Three Rivers, MI 49093

Ph: (616) 273-1415

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